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ABSTRACT

This paper presents research about the relationship between technology education and professional development of teachers and teachers-in-training, and discusses the implications for teachers' professional development. The research method included the use of a four-page survey instrument, follow-up interviews, and journal entries. This paper addresses a review of how educators' perspectives of their profession, work, and worldview changed as a result of learning to use technology for professional and personal purposes. This change is described in terms of perspective transformation learning theory and specific application to the participants' individual contexts. Includes questions for the discussant. Contains 25 references. (Author/AEF)

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**HOW TECHNOLOGY EDUCATION TRANSFORMS
TEACHERS' PERSPECTIVES OF THEIR PROFESSION**

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HOW TECHNOLOGY EDUCATION TRANSFORMS TEACHERS' PERSPECTIVES OF THEIR PROFESSION

ABSTRACT

Research about the relationship between technology education and professional development of teachers and teachers-in-training is presented, and the implications for teachers' professional development are discussed. The research method included the use of a 4-page instrument, follow-up interviews, and journal entries. This paper addresses a review of how educators' perspectives of their profession, work, and worldview changed as a result of learning to use technology for professional and personal purposes. This change is described in terms of perspective transformation learning theory and specific application to the participants' individual contexts.

INTRODUCTION

Having taught technology applications to teachers for several years, this researcher has seen teachers and teachers-in-training change dramatically as they learned how to use technology for their professional and personal purposes. In many cases, there were comments as to how technology changes how the teachers prepare and deliver classroom lessons and student activities. These recounted experiences of change through education were consistent with adult learning theory of transformational learning. This researcher has sought to learn more about the experience and scope of the changes teachers are experiencing as they learn new technologies, and how these changes impact professional development.

THEORY

In the field of education, one comprehensive adult learning theory has begun to dominate the literature -- transformational learning (Cranton, 1997; Merriam & Caffarella, 1999).

Transformational learning begins as a process whereby adult learners critically examine their beliefs, assumptions, and values in light of acquiring new knowledge (Cranton, 1994; Mezirow, 1978, 1994). This self-examination may lead to a foundational "reframing" of the learner's understanding and subsequent actions. These foundational changes alter the adult learner's frame of reference and perspective of circumstances, issues, and actions (Cranton, 1994; Mezirow, 1990, 1994, 1996).

Transformation learning this is a comprehensive theory that allows for understanding and characterizing many of the complexities that adults' experiences bring to the learning process. Indeed, transformation learning is frequently found to be prompted by a "disorienting dilemma," or "trigger event", and proceed through multiple stages of progression (Mezirow & Associates, 1990). The literature has particularly focused on the experience of transformative learning in literacy settings, as in Freire's work (1970), and professional development settings (Mezirow & Associates, 1990); however, it has not focused on teacher training (Taylor, 1998).

Based on research (Chin, & Hortin, 1993-1994; Grant, 1994) and experience teaching teachers and teachers-in-training technology applications to education, perspective transformation learning theory provided a relevant framework in which to view the changes these teachers experience. In these cases the "dilemma" is how to use technology in educational practice and this was confronted in taking a course and learning educational technology. This research offered the opportunity to pair teacher development with transformational learning in order to further

examine the occurrence, nature, and facilitators of perspective transformation experiences related to technology learning. This research was also an opportunity to study what specific changes occurred through these transformational learning experiences. The research is based on several processes: 1) viewing teachers and teachers in training as adult learners, 2) recognizing that transformational learning may occur in the educational process, and 3) realizing that the scope and nature of change in their professional development may be examined.

RESEARCH DESIGN

In this study, a convenience sample of teachers and teachers-in-training in a graduate school of education in a private, urban university was utilized. These teachers and teachers-in-training were taking graduate education courses where they learned and discussed technology applications to the classroom. The courses were conducted in a format that included discussions, small groups, journal writing, presentations, and "hands-on" experience with technology. An assessment tool (King, 1997, 1998a, 1998b), follow-up interviews, and journal entries were used to examine the participants' experiences in educational technology courses.

A phenomenological model of inquiry (LeCompte, Millroy, & Preissle, 1992) has been used in this research, as the researcher sought to allow the participants' responses define the nature of the findings through emergent themes. "The Learning Activities Survey" (King, 1998a), that examines the transformational learning experience in education settings, had been used in other studies including 422 adult learners in higher education (King, 1997) and 208 adult ESL learners (King, in press). This assessment tool was adapted into the "Technology Form" during pilot studies for this research. The resulting 4-page instrument, "The Learning Activities Survey-Technology Form," and small group discussions were used to gather the initial data. "The

Learning Activities Survey" uses a series of objective and free response questions to determine whether a respondent has experienced a perspective transformation and what learning activities facilitated it.

The participants were asked whether they had experienced any of Mezirow's perspective transformation stages (Mezirow & Associates, 1990) in a checklist format, and then queried about the experience they had identified in order that the researcher might be sure it was indeed a perspective transformation. Information from 3 questions were used to determine which category of the 3-point Perspective Transformation Index ("PT-Index") described the responses (King, 1997). A "PT-Index" category of "3" indicates having had a perspective transformation in regard to educational experience in technology classes, a category "2" indicated that they have had a perspective transformation, but not in relation to the educational process, and a category "1" was for those who did not indicate a perspective transformation. Further characterization of emergent themes was done after this initial analysis.

After the responses were tabulated and coded, the resulting preliminary analysis was then tested in follow-up interviews, with guided questions and open inquiry. Additionally, free-form journal entries throughout the semester allowed participants to describe their experience as they explored and began to master technology applications for educational purposes. The small group discussions, interviews, and journal entries provided a substantial data source that was then analyzed and coded for emergent themes. While the majority of research conducted on transformational learning has been of solely a qualitative design, this research design of incorporating multiple methods offers a unique and powerful means of examining the experience of the participants (King, 1997, 1998b).

The research questions considered in this study were 1) What proportion of the sampled population of teachers and teachers-in-training experienced a perspective transformation within the context of their technology education? 2) What learning activities did they perceive as promoting this perspective transformation? 3) What common themes were evident in the perspective transformation experience among these adult learners? and 4) How did the teachers' perspectives regarding their profession and their practice changed?

The final study included 47 teachers and teachers-in-training enrolled in graduate education courses on technology use in education. In order to provide a context for the findings that will be presented, the following demographics are noted. This sample was gathered in the Middle Atlantic region of the United States and may be characterized as follows: gender: 74.5% female, 25.5% male; race: 76.2% white, 4.3% Hispanic, 13.0% black, 4.3% Asian, 2.2% other; 51.0% married, 42.6% single, 6.4% divorced. They had been enrolled in graduate education courses for 1-12 semesters, $M = 2.93$ semesters, and they had been teaching 0 (teachers-in-training) - 22 years, $M = 5.85$ years. The age of the sample was clustered between 25 and 39 years old, 57.2% were in this age bracket. Considering all of these descriptors, a typical profile of a respondent in this study is a female, white, married, 30-year-old teacher with 5.85 years experience, enrolled in her third semester of graduate studies.

FINDINGS

A summary of the findings for the four research questions are presented here along with examples in order to convey best the meaning of the participants. These findings are based on 47 survey responses, 210 journal entries and 8 follow-up interviews.

What Proportion of the Teachers Experienced a Perspective Transformation?

Through the use of the "Learning Activities Survey-Technology Form", it has been found that 91.5% (43/47) of the teachers and teachers-in-training experienced a perspective transformation in the context of learning technology for educational purposes ("PT-Index" = "3") and 8.5% (4/47) had no perspective transformation ("PT-Index" = "1"). These findings indicate that perspective transformation is a frequent experience among this specific group of adult learners, teachers learning technology. Other transformative experiences have been studied to determine how to best facilitate the experience among the participants (Cranton, 1994; Mezirow & Associates, 1990). In the same way, inquiry about the nature and occurrence of perspective transformation among teachers and teachers-in-training has implications for facilitation of professional and staff development.

What Learning Activities Promoted a Perspective Transformation?

Perspective transformations may have many contributors; however, this study gathered information on three major categories of facilitators, learning activities, people, and teaching situation, that were relevant to the teachers' learning and teaching experiences. The respondents selected all those categories that facilitated perspective transformation in relation to technology in education; therefore, the total exceeds 100%. Their responses rank the facilitators as follows: learning activities 68.1% ($f = 32$), people 57.4% ($f = 27$), teaching situation 40.4% ($f = 19$). Since the focus in this paper is on how the classroom experience facilitates transformational learning, the learning activities are focused on here.

"Hands-on" activities, such as class exercises and lab experiences, were most frequently cited as learning activities that promoted perspective transformation at 44.2%. Discussions and reflection were cited at 41.8% and 37.2% respectively, and challenge from the teacher at 34.9%. The frequencies and percentages for all of the learning activities assessed in this study are listed in Table 1.

Table 1. Frequencies of Learning Activities Facilitating Perspective Transformation Among Those with a "PT-Index" = "3".

Learning activity	f	Percent
Class exercises	19	44.2%
Lab experiences	19	44.2
Discussing concerns	18	41.8
Independent reflection	16	37.2
Teacher challenge	15	34.9
Assigned reading	13	30.2
Structure of class	13	30.2
Journal	7	16.3
Other learning activities	6	14.0
Presenting to class	5	11.6
Papers/essays	5	11.6
Writing	5	11.6
Self evaluation	3	7.0

N = 43

These findings support the literature that indicates that teachers prefer "hands-on" formats, such as "hands-on" classroom assignments and lab experiences, for professional development (Rosen, 1998; Wilhite, DeCosmo, & Lawler, 1996). They also support previous studies that demonstrate that critical thinking skill activities, in particular class discussions, are most frequently selected as promoting transformational learning in the classroom (King, 1997, in press) and the singular impact that students place on the "challenge of the teacher" (King, 1997). Together these observations suggest modalities for the professional development of teachers and other adults in learning technology. When, through education, a change in one's perspective about the use of technology happens, very often "hands-on" experiences, teacher encouragement, and reflective practice are involved. This overall characterization of the objective responses of this study is confirmed through the qualitative analysis of free responses, interviews, and journal entries. Such findings have direct implications for the professional development of teachers and adult education practice that will be discussed after all the findings are presented.

One difficulty in the analysis of these data could be that all the learning activities were not used in all the classes. Efforts were made to control this confounding variable in the adapted instrument design and data analysis. One section of the assessment tool gathered data about which learning activities facilitated perspective transformation, while another section asked which of the learning activities were ever used in the class. In this manner, the researcher could compare the frequency of the use of learning activities with the frequency of its promoting

transformational learning. In reviewing this data, it was found that all of the learning activities were used in the classrooms, and therefore could be evaluated in the existing research design.

What Were Common Themes of this Perspective Transformation?

Three common themes in the perspective transformation process were seen among teachers as they learn technology in the context of educational practice: 1) changes in teaching practice, 2) changes in preparation, and 3) increased self confidence with technology use.

Changes in Teaching Practice

The changes in teaching practice may be divided into three major categories: 1) teachers may employ different learning activities with their students, 2) teachers encourage self-directed learning, and 3) teachers encourage critical thinking skills development. These themes are discussed and illustrated with quotes from the participants' responses.

Employ different learning activities. The educators stated that they intend to use different learning activities in their classes because of their experience learning technology applications to education. Some of these different learning activities are inquiry-based learning, simulations, collaborative research projects, and student multimedia presentations. The following descriptions convey the excitement these educators are bringing to their classrooms as they explore new mediums for their teaching.

"The different methods of teaching broke me out of the mold of what is a classroom experience."

"Next year I would like to try Math journaling. It would also be great if I could have the students use e-mail to journal with others across the city or across the country."

"A change in practice has come about as I will be adopting group work and independent research project and encourage students in this way."

"My students not only wrote their reports, but they (also) made and presented multimedia presentations about them to the class. This is now being used as a model."

"... this class has changed my thinking approach to teaching which will change my behavior as to how I will approach teaching in the future. There are so many delivery options that are now available to me."

"Being able to use distance learning in new ways -- virtual tours, visiting with professionals - astronauts, and college introductory courses."

As teachers learn and explore technology, they see firsthand the usefulness of employing different learning activities than usual. In practice, when these educators vary the learning activities they use, it can have positive consequences for the learners. These possibilities excite the teachers and, based on their accounts, they expect to see their students excited and motivated in turn.

Encourage self-directed learning. Teachers also described how technology use has led them to focus on self-directed learning models for their teaching. The teachers frequently contrasted

student-directed learning to the teacher-centered model. Some of them link this transition to greater independence and growth for the students: the realm of learning possibilities for the students becomes much larger.

"Learning more about technology showed me how I could more easily move students toward being self-directed and independent learners."

"Technology provided a means of liberating my students from their dependence on me and vice versa. It has facilitated growth and independence.

"I have seen how much more broadly I can affect my students' learning possibilities and how I might guide them in self-directed learning."

These educators are exploring the transition from teacher-centered to self-directed learning. Technology provides them with opportunities to accomplish this change.

Encourage critical thinking skills development. Through their technology learning experience, the teachers determine that they need to encourage students to develop critical thinking skills to evaluate the multitude of information resources confronting them. Internet exploration, searches, and e-mail discussion groups are just a few of the contexts within which these teachers recognize that learners can access a tremendous amount of information that requires evaluation, sorting, and analysis. Once again, talking about their learners the teachers state,

"Student learning objectives will change because they would have to learn to think more creatively, find new sources of information and develop critical thinking skills."

"An important issues (sic) are the quality of the information on the Internet, making sure data is correct, and how to be aware of critical thinking."

Technology use has given rise to material that needs to be 1) more carefully evaluated, because there are no controls on publication, and 2) immediately evaluated, because users must process it immediately on the screen, rather than leisurely digest a paper-based format. In this way, electronic resources demand critical thinking skills and evaluation by users in a more urgent manner. Technology use in the classroom is supporting the value that critical thinking skills have had as the hallmark of progressive teaching (Fisher, Dwyer, & Yocam, 1996; Gooden, 1996). The worldwide scope of technology presents real-life experiences in such information processing and evaluation at every level. Within this contemporary context, educators begin to look for ways to develop these skills among their learners.

Change in Research Methods and Preparation of Classes

Another area of profound change was in the teachers' research methods and preparation for classes. No longer confined to hand-written overheads, three-dimensional static models, or paper-based resources, teachers begin to look at their preparation as a journey of discovery as they find new ways to research and design curricula. Once again, the accounts convey an excitement over the new possibilities they have encountered for their research and classes.

"It makes me think critically to solve problems. It helps me in my research."

"Now I design web pages for my classes and do searches for information I need."

"Through search engines I have been able to work on research projects for many graduate courses from home. Search engines have provided me with a wealth of information that I can sieve through and use what I need."

"There has been a change in new ways of using technology in my profession. I am able to use the computer for my class projects."

While the challenges of technology may necessitate more time for preparation (Baldwin, 1998), these teachers see the available possibilities for research and preparation as positive and enriching.

Increased Teachers' Confidence

A prominent finding of this research was unexpected. While the researcher anticipated that teachers' views of their classrooms and profession changed through learning technology, she did not realize the impact that such learning had on the empowerment of the teachers. Nonetheless, participants' accounts repeatedly reflect that these educators not only have had a change in perspective about technology use and technology applied to education, but also have become empowered, more confident, and more self-directed learners. The educators describe this empowerment as a conquest and they describe how their lack of understanding had previously been a barrier for them. Once this barrier has been removed, new opportunities are available to the teachers. These are exciting and powerful outcomes for professional development.

"Learning (technology) gave me more confidence to interact with other professional teachers."

"I used to be apologetic for every request for help (regarding computers)... no more, they ask for help from me too."

"I feel that I am keeping up in a changing society - not being left behind. Feeling useful with lots to offer."

"I now feel confident to walk into computer lab and understand what it contains . . . I also feel comfortable engaging in a conversation about computers with anyone. I understand the language! Now that I understand the language I will seek new knowledge and continue to learn."

Comments like these were echoed frequently by the participants of this study. Greater confidence in technology use is empowering these educators to engage in academic exchange and new learning opportunities. This perspective transformation brings a new way of thinking and acting that opens new avenues to move beyond their traditional classroom preparation and practice. No longer puzzled or fearful of technology, its use, and others' views of themselves, these teachers are now ready to explore how technology can support their classrooms.

How Did the Teachers' Perspectives of Their Profession and Their Practice Change?

There are two major ways that technology changed teachers' perspectives of their profession. Teachers noted how technology use transformed their worldview of education, and changed their curricular scope. These changes exhibit how teachers questioned their previously held beliefs

and assumptions and allowed their learning experience to transform their view of their profession and their educational practice.

Transforms Teachers' Worldview of Education

The familiar phrase "the classroom without walls" is becoming a reality for any teacher who masters the basics of telecommunications. For example, the "expansive classroom" is evidenced in teachers' classroom activities, their preparatory research, and their increased dialogue with other educators. Another example cited below is seen in the accounts of teachers who use listservs to acquire new information about their subject areas, their profession, and technology. Such accounts also offer rich examples of transformative experiences. The following quotes further describe the transformation of the teachers' worldview of education.

"Being expose(d) to the Internet broaden(ed) my perception of the availability of the vast amount of information and ideas that exist. The quickness of the retrieval process is awesome."

"Access to technology will have tremendous impact on the ability of ESL students to successfully integrate into United States society."

"I realized that technology opened new doors for me and those that I will come in contact with."

"The listservs bring a worldwide knowledge base to our classrooms. The students can tap into worldwide resources and experts."

"I had no idea how profitable using listservs could be for both teachers and students."

The teachers' classrooms are no longer isolated from the world. This fact brings with it two major consequences: 1) learning can be linked not only to simulated realities, but also real data, and 2) the urgent need for developing sharp critical thinking skills. Students have the opportunity to exchange information and queries with students across the globe as well as experts in their areas of study. The educators are now able to cast their lessons into accurate and close-at-hand global contexts. For example, social studies students may exchange information about their customs and traditions with students from other countries and, in turn, receive first-hand accounts rather than solely a textbook treatment of the topic. In this way, teaching can be application-driven in true-to-life contexts and underwritten with a diversity that the isolated classroom cannot provide.

Changes Curriculum Scope

As evidenced by their responses, a second way in which the teachers' perspective of education changes is in the curricular scope of education. Teachers change what teaching methods and materials they use in the classroom. While teachers may still use a particular learning theory or philosophy of practice like constructivist theory as the foundation for their educational process, the means by which they do this is expanded to include the technologies available to them and their class. For example, English teachers now may have students evaluate writing on selected web pages of interest to hone editing skills. Additionally, teachers who have relied on handwritten drafts of essays in the past, mention that the standard for the final product has risen considerably with the added resource of computer generated documents.

Regarding the change in perspective, "I see new ways to use technology, this makes its use more meaningful."

"The use of the textbook is not the only way to learn with the age of technology and use of innovation I have found some courses here at _____ University to be more interesting, more thought provoking and very practical to everyday life situations. Technology is a good way to teach."

"I would like to have the opportunity to have my class evaluate the Internet. I think my fourth grade class is very capable of evaluating a web site."

"There are several components that challenge the student to learn including collaboration, interaction, information, hands-on experience, the instructor's ability to meet the needs of the students, the instructor's expertise, (and) the instructor's ability to motivate the student to reach beyond their experience. These components and more, in your class, have helped me to expand my learning beyond what I could have expected."

"I can cover more in my class lessons, the students do not have to wait for the teacher to give them the information. Learning can be fun."

To go beyond the usual curricular scope, teachers are using technology to expand the experience and knowledge base of learners. While they still might invite guest speakers, their speakers may now visit electronically as "virtual guests" through Internet or videoconference technologies. In addition, while the students may still present their research findings to the class, now they may

be creating more sophisticated presentations through computer-driven and multimedia technologies. Rather than focusing exclusively on increasing test scores, these teachers are also looking for their students to achieve greater and additional objectives; their perspective of the curriculum has been changed, transformed, through learning to use technology for educational purposes. The curriculum has been broadened beyond the basics to include the opportunities and skills needed in our increasingly technology driven and dependent society.

Overall, the consequences of the changes these teachers experience as they learn technology applications may be characterized as empowering, exciting, and extending the work of teachers in the educational process. Several preconceived ideas about teaching methods, curricular scope, worldview of teaching and technology have changed because of learning technology application to education. The experience did not define or prescribe the teachers' actions, but instead served in several ways as a foundation for their teaching and their own lifelong learning.

DISCUSSION

Transformational learning theory draws attention to the changes that adults experience as they learn and adopt new frames of reference and meaning perspectives. In this study, the free-responses, journal entries, group discussions, and interviews provided a window into this change among teachers learning technology. Throughout the accounts the challenging of beliefs, assumptions, and values related to teaching were brought into question and re-examined in light of new learning.

The teachers learning technology frequently had perspective transformation experiences. With a rate of occurrence of 91.5% it is evident that learning technology application entails a new way

of thinking about technology and education. These teachers also indicated that "hands-on" activities and critical reflection were important in facilitating the perspective transformation. Altogether these findings indicate a new way to think about teachers learning technology application to education.

As we discuss the themes of perspective transformation that teachers experience as they learn technology, several observations come to the forefront for each theme. Based on their responses, these teachers were constantly looking for new ways to reconceptualize and apply technology learning to education. While educators' "frames of reference" for their teaching shifts, there are many possible consequences for their professional practice.

Themes

Changes in Practice

Changes in teaching practices are a major group of these consequences of learning technology applications to education. As teachers were learning technology, they were quick to note trends in learning activities and teaching models. As teachers learn and explore technology, they see the usefulness of employing different learning activities than usual. As the teachers employ alternative teaching methods, they will reach students with different learning styles- thereby extending the learning for their classes. The different learning activities also seem to serve as a reservoir of ideas from which the teachers may select diverse activities at any given time. This seems to excite the teachers and they expect to see their students excited and motivated in turn.

Secondly, several of the teachers described how their focus of learning had changed. They mentioned a shift from a teacher-centered to learner-centered approach and related learning

activities. (See also Chin and Hortin, 1993-1994.) This is a change that several teachers noticed and remarked upon; these teachers also saw the shift of the locus of learning from teacher to student as positive. Some of the benefits to this change have been recorded in the literature as more accelerated learning, greater motivation for learning and more development of critical teaching skills (Fisher, Dwyer, & Yocam, 1996).

A third consequence of these learning experiences is that teachers intend to encourage students to develop critical thinking skills to evaluate the multitude of information resources confronting them. Internet exploration, searches, and e-mail discussion groups are just a few of the contexts within which students can access a tremendous amount of information that requires evaluation, sorting, and analysis. The worldwide scope that technology brings is a real-life experience in such information processing and evaluation.

Change in Research Methods and Preparation

The second major theme of the teachers' perspective transformation is evident in the many changes in their research method and preparation of classes. They are doing research and tapping additional resources that they otherwise would have had difficulty accessing. The teachers are also preparing their classes differently as they make computer-generated overheads and web pages to support their lessons. Greater research and preparation should have positive results in the classroom (Baldwin, 1998).

Increased Self-Confidence

The final theme of perspective transformation among these teachers was that they became more empowered and self-confident. No longer puzzled or fearful of technology, its use, and others'

views of them, these teachers are now ready to explore how technology can support their classrooms and their professional development. The obstacles they previously faced with technology are no longer in the way. There is again, excitement and keen anticipation as they employ technology as an assistant in their teaching.

Perspectives of Profession and Practice

The teachers' perspective of their profession and practice changed when they learned technology. These changes were characterized in 2 dimensions that were broader than the themes of perspective transformation. As the teachers' worldview of education expanded, there were new opportunities. Technology may enable a firsthand global meaning of content being learned rather than a removed, secondhand experience through media previously available.

As many of the teachers changed the scope of their curriculum as they learned educational technology, exciting extensions of their work emerged. Going beyond the familiar standards and objectives of the curriculum, these teachers were incorporating new opportunities and skills. The raw potential of technology was being focused on educational needs. Instead of technology merely being a tool to meet familiar goals, technology was being employed to reach greater goals. The perspective transformation that these teachers experienced had definite consequences for their view of their profession and their practice.

IMPLICATIONS AND RECOMMENDATIONS FOR PRACTICE

Given that learning to use technology in the context of education, has consequences for classroom practice and curricular, there are other implications as well. These implications are

represented in two major categories, those regarding 1) teacher education and faculty development content and format, and 2) academic exchange among educators.

Teacher Education and Professional Development

The content of technology education is driven by one of the major difficulties facing educators today -- the need to keep pace with technology, its adoption in our society, and its application to the classroom. Educational institutions must respond to the technology needs of teachers by building a background in educational technology theory, use, and related issues. These were aspects of technology application that the teachers in this study responded to and should become foundational components of today's and tomorrow's teachers' preparation. Teachers' academic training should include opportunities to explore, use, master, and apply technology to the educational process. The learning experiences in this research included using and integrating technology across the curriculum, and exploring new technologies in order to master their application to professional and personal development and is suggested for teacher education.

Previous research has demonstrated that educators appreciate and learn from "hands-on" faculty development initiatives (Boyd, 1997; Chin & Hortin, 1993; Rosen, 1998; Wilhite, DeCosmo, & Lawler, 1996). This study confirms the impact of the "hands-on" format for technology education for teachers. The format of technology education also has consequences on a local level, administrators who recognize the need for teachers' technology education should provide welcoming, quality, well-supported faculty development initiatives that provide "hands-on" experience for technology education and curriculum development (Burke, 1997; Chin & Hortin, 1993; King, 1998c).

The impact that the learning experiences in this study have had on the teachers encourages discussion of what made these learning experiences truly transformational. Furthermore, studying the experience of teachers in this area offers specific recommendations about "hands-on" activities, class discussion, independent reflection, informative reading, and on-going development workshops as a basis for such staff development efforts. A key factor that was mentioned many times by the participants in this study was the combination of dialogue and practice; workshops focusing on technical skills within the professional context will foster the transformational learning that changes teaching practice.

Academic Exchange

A final implication is seen in the educators' resources and dialogue. Once again the traditional boundaries of classroom, school, district, and state, are greatly reduced as educators can easily, quickly, and inexpensively exchange information and needs with others beyond their geographical region. This dialogue holds the possibility of collaborative literary inquiry and action research projects for those educators who are capable of using basic e-mail, searching, and web page development skills. For example, as teachers develop web resources for their classrooms, these may be indexed publicly so that other teachers may glean ideas from them and other classes may use them. Such exchange can bridge distances and foster positive and productive collaborative relationships (Di Petta, 1998). These relationships may also afford opportunities to discuss and understand the perspective transformations the teachers are experiencing. An interesting dynamic is evident in these relationships as sometimes disclosure is facilitated by the accessibility, yet "safe" distance possible through technology (Eastman, 1995).

The professional development of educators is no longer solely contingent on paper-based journals and professional conferences. Instead educators who have learned technology applications can readily access and distribute information on a moment-to-moment basis.

CONCLUSION

The call to infuse education with the benefits of technology resources is heralded worldwide, yet many questions as to technology's influence on our teachers and classrooms have remained unexplored. This study examines the ways in which teachers and teachers-in-training experience change in their perspectives of their profession, work, and worldview as a result of learning to use technology for professional and personal purposes. In this paper, transformational learning theory provides a framework by which changes in teachers' thinking and concomitant actions are revealed. Additionally, specific applications to educational practice also have been discussed extensively. Implications of the findings include recommendations for teacher training and staff development initiatives, the support of classrooms in global and diverse contexts, and the fostering of academic exchange and collaboration among classroom teachers. Technology learning within the educational context holds much promise for the continuing development of educators and their practice.

REFERENCES

- Baldwin, R. G. (1998). Technology's impact on faculty life and work. In K. Gillespie, (Ed.), The impact of technology on faculty development, life, and work. (pp. 7-22). New Directions for Teaching and Learning (No. 76). San Francisco: Jossey-Bass.
- Boyd, E. G. (1997). "Training-on-Demand." A model for technology staff development. Educational Technology, 37(4), 46-49.

- Burke, K. (1997). Responding to participants' learning styles during staff development. The Clearing House, 70(6), 299-301.
- Chin, S. S., & Hortin, J. A. (1993-1994). Teachers' perceptions of instructional technology and staff development. Journal of Educational Technology Systems, 22(22), 83-98.
- Cranston, P. (Ed.). (1997). Transformative learning in action: Insights from Practice. New Directions in Adult and Continuing Education (No. 74). San Francisco: Jossey-Bass.
- Cranston, P. (1994). Understanding and promoting transformative learning: A guide for educators of adults. San Francisco, Jossey-Bass.
- Di Petta, T. (1998). Community on-line: New professional environments for higher education. In K. Gillespie, (Ed.), The impact of technology on faculty development, life, and work (pp. 53-66). New Directions for Teaching and Learning (No. 76). San Francisco: Jossey-Bass.
- Eastman, D. V. (1995). Alone but together. New York: Hampton Press.
- Fisher, C., Dwyer, D. C., & Yocam, K. (Eds.). (1996). Education and technology. San Francisco: Jossey-Bass.
- Freire, P. (1970). Pedagogy of the oppressed. New York: Seabury.
- Gooden, A. R. (1996). Computers in the classroom: How teachers and students are using technology to transform learning. San Francisco: Jossey-Bass.
- Grant, J. M. (1994). Changing teachers' attitudes toward computers through education: A study of the process of change. Unpublished dissertation. University of Illinois at Chicago, Chicago, IL.
- King, K. P. (1997). Examining learning activities and transformational learning, International Journal of University Adult Education, 36 (3), 23-37.

King, K. P. (1998a). A guide to perspective transformation and learning activities: The Learning Activities Survey. Philadelphia: Research for Better Schools.

King, K. P. (1998b). How adult learners change in higher education (pp 209-214). 39th Annual Adult Education Research Conference, San Antonio, TX.

King, K. P. (1998c). Keeping pace with technology: guidelines for empowering teachers with technology skills, Impact on Instructional Improvement (NYASCD), 27(2), 13-20.

King, K. P. (in press). Changing language, culture, and self: The adult ESL experience of perspective transformation. 40th Annual Adult Education Research Conference, DeKalb, IL.

LeCompte, M. D., Millroy, W., & Preissle, J. (Eds.). (1992). The handbook of qualitative research in education. New York: Academic Press, Inc.

Merriam, S., & Caffarella, R. (1999). Learning in adulthood (2nd ed.). San Francisco: Jossey-Bass.

Mezirow, J. (1978). Education for perspective transformation: Women's re-entry programs in community colleges. New York: Teacher's College, Columbia University.

Mezirow, J. (1994, Summer). Understanding transformation theory. Adult Education Quarterly, 44(4), 222-232.

Mezirow, J. & Associates. (1990). Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning. San Francisco: Jossey-Bass.

Rosen, D. (1998). Adult learning and the Internet. Boston: Adult Literacy Resource Institute.

Taylor, E. (1998). The theory and practice of transformative learning: A critical review. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education, The Ohio State University.

Wilhite, S. C., DeCosmo, A. D., & Lawler, P. A. (1996, October). Faculty as adult learners; Implications for faculty development initiatives. The Eastern Adult, Continuing, and Distance Education Research Conference Proceedings. Penn State University: University Park, PA. [CD-ROM].

My Questions for the Discussant

Is the research design described clearly and sufficiently?

What additional questions may be asked of the data?

As research continues, what direction is suggested for further inquiry into the subject matter?

What information could additional statistical tests garner?

How do I narrow the implications? (As suggested by one reviewer)